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Paper No. 21

Appeal No. 91-2458

BOARD OF PATENT APPEALS  
& INTERFERENCES

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ON BRIEF

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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Ex parte Michio Asahina

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Application for Patent filed February 2, 1988, Serial  
No. 151,361. Semiconductor Device.

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Jay M. Finkelstein et al. for appellant.

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Supervisory Patent Examiner - Rolf Hille  
Examiner - S. Loke

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Before Lynch, Thomas and Cardillo, Examiners-in-Chief.

Thomas, Examiner-in-Chief.

This is a decision on the appeal from the examiner's  
final rejection of claims 1 to 22, which constitute all the claims  
in the application.

Representative claim 1 is reproduced below:

1. A semiconductor device comprising:

a substrate having a doped semiconductor region, a gate  
wiring, a lower conductor structure, an insulating layer overlying  
said lower structure and having at least one through opening  
extending to said lower conductor structure, and an upper conduc-  
tor structure connected to said lower conductor structure via said

through opening, wherein said upper structure comprises: at least one layer of a metal, a metal silicide, a metal nitride, a metal carbide or a conductive oxide film, and an electroplated or electrolessly plated metal plating layer disposed on and adhering to said at least one layer.

The following references are relied on by the examiner:

Baudrant et al. (Baudrant)	4,593,454	June 10, 1986
McDavid	4,672,419	June 9, 1987
		(filed June 25, 1984)
Brasen et al. (Brasen)	4,725,877	Feb. 16, 1988
		(filed Apr. 11, 1986)
Sasaki	4,761,677	Aug. 2, 1988
		(filed Jan. 22, 1987)

Howard, "Electromigration Improvement OF Al-Cu OR Au Conductors," IBM Technical Disclosure Bulletin, Vol. 21, No. 12, May 1979, pp. 4837-4838.

Claims 1 to 22 stand rejected under 35 U.S.C. 103. As evidence of obviousness the examiner relies upon McDavid and Howard as to claims 1 to 10 and 20 with the addition of Baudrant as to claim 11. The examiner has rejected claims 12, 13 and 15 to 17 under 35 U.S.C. 103 in view of the collective teachings of McDavid, Howard and Sasaki, with the addition of Brasen as to claims 14, 18 and 19. There is also a separate rejection for claims 21 and 22 under 35 U.S.C. 103 in view of Sasaki and Howard.<sup>1</sup>

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<sup>1</sup> As noted at the bottom of page 8 of his answer, the examiner withdrew the rejection of various claims under 35 U.S.C. 112.

Rather than reiterate the arguments of the appellant and the examiner, reference is made to the briefs and the answer for the respective details thereof.<sup>2</sup>

OPINION

After thoroughly considering the positions of the appellant and the examiner as well as the teachings of the respective references relied upon by the examiner, we agree with the examiner that claims 1 to 20 are directed to subject matter that would have been obvious to one of ordinary skill in the art within the meaning of 35 U.S.C. 103 based upon the evidence provided by the applied prior art. However, we reach an opposite result with respect to the rejection of claims 21 and 22, but enter a new ground of rejection thereof under the provisions of 37 CFR 1.196(b).

At the outset, we note that the examiner has concluded that the claims stand or fall together at the top of page 2 of the examiner's answer. In considering the appellant's comments at the bottom of page 3 and the top of page 7 of his principal brief, we reach the same conclusion. Furthermore, the examiner's assessment

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<sup>2</sup> Whether the examiner's arguments with respect to the product-by-process claim limitations in the claims on appeal amount to a new ground of rejection as argued in the reply brief, we consider this a moot issue since the examiner entered the reply brief and it has been fully considered by us.

that the claims stand or fall together has not been disputed in the reply brief which was entered by the examiner. Inasmuch as appellant has also chosen not to present any arguments with respect to the particulars of dependent claims 2 to 20, these claims all fall with parent claim 1. Note In re Nielson, 816 F.2d 1567, 2 USPQ2d 1525 (Fed. Cir. 1987); In re Kaslow, 707 F.2d 1366, 217 USPQ 1089 (Fed. Cir. 1983); and In re Wiseman, 596 F.2d 1019, 201 USPQ 658 (CCPA 1979).

In light of the above analysis, we sustain the examiner's rejection of independent claim 1 (among claims 1 to 10 and 20) in view of the collective teachings of McDavid and Howard. The examiner's assessment of McDavid alone at the top of page 3 of the answer is sufficient to have rendered obvious the subject matter of claim 1 on appeal. Appellant does not dispute the examiner's reliance upon McDavid and his application of this reference to claim 1 on appeal. More specifically, the examiner's basic position is that the plural layer metal-to-silicon contact 14 in Figure 1 is utilized to contact the source/drain regions 13 by means of an intermediate tungsten silicide layer 20 which comprises the claimed lower conductor structure. The plural layer metal-to-silicon contact 14 comprises the plural layer upper structure set forth at the end of claim 1 on appeal.

The end of claim 1 recites the plural layer upper structure as comprising in part "at least one layer of a metal, a metal silicide, a metal nitride, a metal carbide or a conductive oxide film." Plainly, the tungsten layer 20 in Figure 1 of McDavid meets the recitation of a metal among the plural alternatives provided by this limitation. In addition to this limitation and on top thereof is placed the claimed metal plating layer which comprises the molybdenum layer 21, the tungsten layer 22 and the gold layer 23. As indicated at column 3, line 56 to column 4, line 2 of McDavid, the layers 21, 22 and 23 are "deposited" on top of tungsten layer 20. There is no further specific recitation in McDavid as to what this deposition entails but we construe this comprehensive teaching as comprising any known coating technique including sputtering, electro-deposition, electroplating, electrolessly plating, evaporation, etc. This view is consistent with the definition of the word "deposit" in the Mc-Graw Hill Dictionary of Scientific And Technical Terms, Second Edition, 1978, at page 429 (copy attached), which states in part that it comprises "any material applied to a base by means of vacuum, electrical, chemical, screening, or vapor methods." The artisan in the art of integrated circuit fabrication would have readily recognized that the deposition approach broadly defined by McDavid would have included electroplating and electrolessly plating techniques ↵

common in that art. Not only the specific teachings of a reference but also reasonable inferences which the artisan would have logically drawn therefrom may be properly evaluated in formulating a rejection. In re Preda, 401 F.2d 825, 159 USPQ 342 (CCPA 1968) and In re Shepard 319 F.2d 194, 138 USPQ 148 (CCPA 1963). Skill in the art is presumed. In re Sovish, 769 F.2d 738, 226 USPQ 771 (Fed. Cir. 1985). Furthermore, artisans must be presumed to know something about the art apart from what the references disclose. In re Jacoby, 309 F.2d 513, 135 USPQ 317 (CCPA 1962). The conclusion of obviousness may be made from common knowledge and common sense of a person of ordinary skill in the art without any specific hint or suggestion in a particular reference. In re Bozek, 416 F.2d 1385, 163 USPQ 545 (CCPA 1969). Every reference relies to some extent on knowledge of persons skilled in the art to complement that which is disclosed therein. In re Bode, 550 F.2d 656, 193 USPQ 12 (CCPA 1977).

Thus, we conclude that the teachings of McDavid alone, to the artisan, would have rendered obvious the subject matter of independent claim 1 on appeal. We are mindful that the transition metal nitrides in Howard are not electroplated or electrolessly plated in accordance with the teachings therein. However, we are also mindful that the electromigration improvement problem outlined by Howard is common to that which has been minimized in

McDavid according to his teachings at column 2, lines 49 to 54, which are in part problems which appellant attempts to avoid from the prior art Figures 1 and 3 of his specification as filed which include various flaws, projections, voids and cracks. None of the claims on appeal recite any purpose to overcome these problems in the prior art nor any reference to overcoming these problems recognized in the prior art.

Turning next to the rejection of claims 21 and 22 under 35 U.S.C. 103 in view of the teachings of Sasaki and Howard, we do not sustain this rejection. The examiner's view of Sasaki as applied to the limitations of claim 21 is flawed in that he apparently considers the polyacetylene layer 10a in Figure 2 to be a conductive portion, where the teachings at column 3, lines 28 to 33, clearly indicate that such a region is an insulating portion rather than a doped or conducting portion. Even if we were to consider the conductive interconnecting layer 10b in this Figure as the claimed lower conductor portion, there is still no teaching in this reference of a metal plating layer formed in an opening such as opening formed by region 12b in Figure 2 of Sasaki. Although region 12b is a conductive interconnecting layer, it is not formed of metal but is formed rather of a doped polyacetylene layer. Even considering the alternative embodiments in Figures 5 and 6 of Sasaki, we reach a similar conclusion. There is simply

Appeal No. 91-2458

no teaching in these embodiments of a metal plating layer formed in an opening as required at the end of claim 21 on appeal. Consequently, we will not sustain the rejection of dependent claim 22 as well.

NEW REJECTION UNDER 37 CFR 1.196(b)

Claims 21 and 22 are rejected under 35 U.S.C. 103 in view of the teachings of McDavid as outlined earlier in this opinion with respect to our affirmance of the rejection of claim 1 on appeal. The claimed metal plating layer formed in an opening may comprise the molybdenum layer 21 in Figure 1 of McDavid, which according to the earlier discussion with respect to its "deposition" would have reasonably been interpreted by the artisan within the teachings of McDavid to have been electroplated or electrolessly plated. Furthermore, the claimed conductor structure component formed thereon comprises the plural layers of tungsten 22 and gold 23 (see also claim 22). These layers are also in part placed upon or overlap the insulating layer of silicon oxide 31 in accordance with the recitation at the end of claim 21.

It is believed that this analysis has adequately addressed appellant's remarks in the principal brief. Notwithstanding appellant's extensive arguments in the reply brief relative to the product-by-process claim limitations of the claims



on appeal, we are in agreement with the position of the examiner that the limitations of the claims relating to electroplating and electrolessly plating are properly to be given no patentable weight in the analysis of the claims on appeal. In re Thorpe, 777 F.2d 695, 227 USPQ 964 (Fed. Cir. 1985) and In re Brown, 459 F.2d 531, 173 USPQ 685 (CCPA 1972) make it clear that the patentability of a product claimed does not depend on its method of production. If the product claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. In re Marosi, 710 F.2d 799, 218 USPQ 289 (Fed. Cir. 1983). The manner of making, electroplating or electrolessly plating in this case, has not been shown by appellant by appropriate evidence to be a structural feature and thus a physical characteristic of a product or device claimed. Note In re Thorpe, supra; In re Marosi, supra; and In re Fessmann, 489 F.2d 742, 180 USPQ 324 (CCPA 1974). These are all cases cited by appellant in his reply brief.

We are not in a position to agree with appellant's assertion that the referenced claim limitations to electroplating and electrolessly plating may be properly considered to define a physical aspect of the claim structure. Appellant's remarks with respect thereto in the reply brief as well as those relating to the advantages of electroplating and electrolessly plating at the

bottom of page 6 of the principal brief may be well taken, but amount only to attorney arguments which are not qualitative evidence on the issue. Note In re Scarbrough, 500 F.2d 560, 182 USPQ 298, 301 (CCPA 1974). See also In re Wiseman, supra. Notwithstanding appellant's potential ability to provide some form of evidence that electroplating or electrolessly plating amounts to a physical or structural limitation, appellant must also address the problem that the specific teaching of the "deposition" of the various metal layers comprising the contact 14 would have been reasonably construed by the artisan as including electroplating or electrolessly plating deposition techniques as conventional in the art.

SUMMARY

We have sustained the rejection of claims 1 to 20 under 35 U.S.C. 103 and reversed the rejection of claims 21 and 22 under 35 U.S.C. 103. However, we have entered a new ground of rejection of claims 21 and 22 under the provisions of 37 CFR 1.196(b). Accordingly, the decision of the examiner is affirmed-in-part.

Any request for reconsideration or modification of this decision by the Board of Patent Appeals and Interferences based upon the same record must be filed within one month from the date hereof (37 CFR 1.197).

Appeal No. 91-2458

With respect to the new rejection under 37 CFR 1.196(b), should appellant elect the alternate option under that rule to prosecute further before the Primary Examiner by way of amendment or showing of facts, or both, not previously of record, a shortened statutory period for making such response is hereby set to expire two months from the date of this decision. In the event appellant elects this alternate option, in order to preserve the right to seek review under 35 U.S.C. 141 or 145 with respect to the affirmed rejection, the effective date of the affirmance is deferred until conclusion of the prosecution before the examiner unless, as a mere incident to the limited prosecution, the affirmed rejection is overcome.

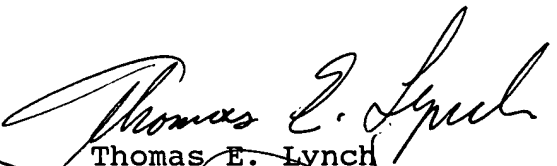
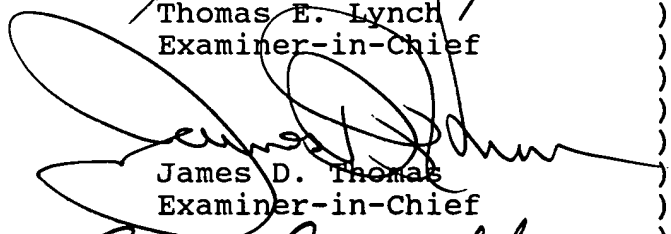
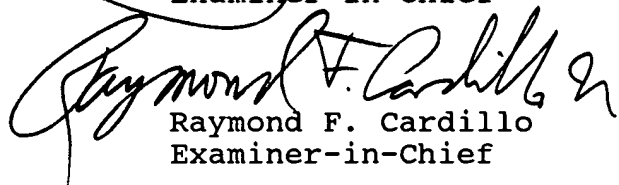
If the appellant elects prosecution before the examiner and this does not result in allowance of the application, abandonment or a second appeal, this case should be returned to us for final action on the affirmed rejection, including any timely request for reconsideration thereof.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR 1.136(a). See the final rule notice, 54 F.R. 29548 (July 13, 1989), 1105 O.G. 5 (August 1, 1989).

Appeal No. 91-2458

Effective August 20, 1989, 37 CFR 1.196(b) has been amended to provide that a new ground of rejection pursuant to the rule is not considered final for the purpose of judicial review under 35 U.S.C. 141 or 145. See the final rule notice published at 54 Fed. Reg. 29,548 (July 13, 1989) and 1105 O.G. 5 (Aug. 1, 1969).

AFFIRMED-IN-PART  
37 CFR 1.196(b)

	)	
Thomas E. Lynch	)	
Examiner-in-Chief	)	
	)	
James D. Thomas	)	
Examiner-in-Chief	)	
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Raymond F. Cardillo	)	
Examiner-in-Chief	)	

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